

URBAN HISTORICAL AND CULTURAL COMMUNITY SPACE BASED ON SPACE SYNTAX ANALYSIS AND EXPLORATION—— TAKING CHONGQING JIALINGXI VILLAGE AS AN EXAMPLE

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Abstract: Urban historical and cultural communities are the embodiment of the city's heritage and cultural undertones. This paper aims to sort out Chongqing's historical and cultural communities and selects a representative community, Jialingxi Village, for research, analyzes the subject spatial feelings and needs of residents in Jialingxi Village through field research, combines the spatial syntax of convex space, integration degree, comprehensibility and the spatial data available were analyzed by combining the parameters of space syntax such as convex space, integration, comprehensibility and viewable area for internal and external space. The study shows that the comfort and pleasantness of the community space is poor, its external space has a high degree of integration, the traffic is well developed, the pedestrian flow is dense, there are differences in the selection degrees of different entrances and exits, some of the internal paths have many turns, there is a low possibility of pedestrian flow through, the visibility of the main road is insufficient and the guidance is weak. At the end of the paper, a targeted community renewal strategy is proposed to provide ideas that can be used for the transformation of urban historical and cultural communities under the rural revitalization strategy.

Keywords: Historical and cultural communities; Spatial syntax; Jialingxi Village; Strategies and method

1 INTRODUCTION

The memory of buildings in a city is short-lived, while urban space is a long-term memory unique to a city. At present, China is in a stage of rapid urbanization. While the scale and quality of cities are steadily improving, it has also led to the problem that the construction of traditional communities is out of touch with the rapidly developing cities, that is, it is slowly fading from the memory of urban space. Striving to create a good cultural atmosphere, improve the comfort of community space, and regain the citizens' spatial memory and emotional belonging to it has become a topic of concern to the government and society.

This paper selects representative community spaces in Chongqing (Dajingxiang, Huguang Guild Hall, Baixiang Street, Pavilion, Eighteen Ladders, Xinde Village, Shengli New Village, Zhangjia Garden, No. 13 Yard, Ma'anshan Village, Jialingxi Village, Shangxiaojiaowan, Daping Village), and selects one to study the historical community space. Taking "Jialingxi Village" as an example, it explores the spatial response strategies of "quasi-urban villages" in the current mother city of Chongqing, which have prominent social problems and are unable to be renewed, facing the real dilemma of spatial environment decline, neighborhood culture fading, and community historical culture disappearing, and strives to achieve the integration of theory and reality[1].

2 RESEARCH SUBJECTS

2.1 Basic Overview

Jialingxi Village in Yuzhong District is located between Shangqing Temple and Niujiaotuo. It is part of the Shangqing Temple Road Community of Shangqing Temple Street. It is surrounded by Jialingqiao Road, Rail Transit Line 2 and Shangqing Temple Road. The geographical location and traffic conditions of the community are very superior. It covers an area of about 5.75hm², with 64 residential buildings and 2,248 households, and the permanent population accounts for about 2/3 of the total population. In addition, the two anti-Japanese war sites in the community are also worth noting, including Song Ziwen's former residence (Yiyuan) and Xian Ying's former residence (Xianzhai). The Chongqing negotiations were held in Song Ziwen's former residence, and Marshall, the chief of the US Army, Navy and Air Force and the president's special envoy, also lived here during his visit to China. Jialingxi Village has both the atmosphere of life and historical heritage, so its research value and significance are very high (Figure 1).



Figure 1 Schematic Diagram of the Current Situation of Jialingxi Village

2.2 Research Significance

The survey and literature review in the following text found that the aging characteristics of the community are very obvious, and there are few young people in the community. It is speculated that the height difference at the entrance of the community is too large, which makes walking inconvenient, and the environmental quality is not controlled, so young people are unwilling to live here. Although the community is rich in green vegetation, it lacks effective management and maintenance, and the vitality of the entire space is very low. The public space in the community lacks node design, and the rich historical and cultural heritage has not been reflected.

From the perspective of spatial environment and behavioral psychology, the spatial sentence method is used to qualitatively analyze the spatial problems existing in the current Jialingxi Village community space. In the field research part, the relevant concepts and methods of behavioral psychology are used to focus on people's actual spatial experience and psychological feelings, and try to establish a corresponding relationship between space and emotion, and propose strategies and methods based on research and analysis[2].

It is hoped that through this study, corresponding spatial renewal methods will be proposed to continue the historical memory of the community, explore the neighborhood culture and community spirit, contribute to the renovation and renewal of the community space environment, conduct targeted analysis for this type of space, explore the related elements of space, find people's psychological expression demands, effectively promote the sense of belonging and pride of the community, and continue the cohesion of the community.

2.3 Research Methods

This study mainly involves two research methods: space syntax and environmental behavior. Space syntax was first proposed by Bill Hillier of UCL in the 1970s. It is a new language and method for describing architectural and urban spatial patterns. This method believes that the sum of the topological relationships of all spatial nodes in the system is the organizational structure of the space. The characteristics of a spatial node are determined by its relationship with all other spatial nodes. It mainly uses methods such as "natural movement" and visibility graph analysis to study spatial relationships and uses mathematical models to analyze spatial nodes. These methods are inconsistent with the traditional concept of space. It links space with social economy and believes that space is a complex affected by multiple factors.

Spatial syntax indicators include five indicators such as connection value, integration, and selectivity, as well as some concepts. After analysis, we select analysis parameters that have obvious significance for the results to study the spatial structure of Jialingxi Village. We choose to analyze urban space with parameters that have been processed to achieve integration, integration, and selectivity. In the analysis process of this article, the space syntax related concepts used are convex space, integration, selectivity, and visual integration[3].

Convex space, which is a two-dimensional plane, reduces one dimension based on the actual spatial state. Assuming that any two points in a space are visible to each other, this is called a convex space, that is, any two points can see each other. This study uses the convex space analysis method to analyze the smaller-scale Jialingxi Village, which has strong applicability.

Integration refers to the degree of agglomeration or dispersion between a certain element and other elements in a spatial system. It is a parameter that reflects the attractiveness and convenience of a space for transportation, and is an indicator for judging the centrality of a space in a system. Generally speaking, the higher the integration, the higher the accessibility and centrality of the space, and the easier it is to gather people. Integration can be divided into overall integration and local integration. This paper analyzes the global integration of Chongqing's main urban area and the local integration of Jialingxi Village, from surface to point, which can better reflect the spatial hierarchy and information of Jialingxi Village in the city.

The shortest topological distance between two nodes in a spatial system is called the spatial selectivity of the system. It is a parameter used to measure the shortest path of the spatial system, that is, the possibility of people entering the space.

The higher the spatial selectivity, the greater the possibility of people crossing the space. Starting from a specific element to reach another element, the line of sight needs to turn several times in total. Feed this value back and record it at the starting point. After exhausting all possibilities of all other elements as the end point, sum the number of conversions and feed its value back to the top of the starting point, which is the visible depth of the starting point. After having this value, RA and RRA are calculated step by step, and finally the value of integration is calculated, which is defined as the realized integration value of this spatial element. The meaning of this value is that the larger the value, the fewer turns are required for this element in the space to see other elements; the smaller the value, the more turns are required to see other elements from this element.

This study first established the CAD general plan of Jialingxi Village, which meets the basic conditions for space syntax research, and then converted it into a convex space layout diagram in DepthMap software, and then established the corresponding relationship to calculate various parameters to obtain the analysis in the following text[4].

Environmental behavior, also known as environmental psychology, mainly studies the relationship between human behavior (including experience and action) and its corresponding environment (including material, social and cultural), and attempts to apply the basic theories, methods and concepts of psychology to understand material space activities and people's reactions to the space environment, and then feed back to space design to improve the living environment of human beings, and to elevate people's activity habits and designers' sensory experience to a theoretical level for elaboration. The author applies this theory to field research, and through field visits and surveys of the necessary activities, spontaneous and social activities of the residents of Jialingxi Village, combined with demand surveys, etc., reflects the real and reliable psychological needs and spatial memory of the residents.

2.4 Field Research

The author conducted three field surveys in Jialingxi Village, mainly investigating the use of public spaces in the entire block, and studying the use of different public spaces from four aspects: activity subjects, activity methods, activity attributes, and negative behaviors. By investigating local spatial activities, the purpose of understanding the activities of the entire block can be achieved. The specific method is to conduct statistics on public activity spaces in the block, using one day, taking 15 minutes as the statistical period in the time period of 8:00-18:00 as a statistical period, and counting each section twice. In terms of point selection, representative nodes in Jialingxi Village were selected for investigation, based on whether it is an intersection, the flow of people, whether it has historical and cultural elements, and whether the spatial characteristics are prominent (Figure 2-3, Table 1).



Figure 2 Active Nodes

Table 1 Statistics of Jialingxi Village Residents' Activities

Time	Work	trade	Sit back	walk	Standi ng	play	Small talk	play cards	total
Mornin g	5	4	4	3	5	10	5	0	36
noon	3	1	2	1	1	2	0	0	7
afterno on	0	0	5	2	3	5	6	12	33

In order to study the psychological needs and emotional memories of the residents of Jialingxi Village, the author randomly interviewed 20 people of different ages and genders during the survey, and interviewed them from five dimensions: accessibility, comfort, pleasure, sense of belonging, and sense of security, in order to understand the general psychological demands of users.

The information of the interviewees included age, gender, place of residence, educational background, etc. The author selected different types of interviewees during the interview process, which can ensure the comprehensiveness of the interviewees and objectively reflect the credibility and effectiveness of the interview. By sorting out and summarizing the interview results, the interview data was finally presented in the form of charts[5].

From the feedback on the site, the feasibility, accessibility and safety of the community can better meet the use requirements of users, and the comfort and pleasure of the community space are the main factors of user dissatisfaction.

Most interviewees believe that the street space of the community is not perfect, the community roads are too complicated and not beautiful enough; the internal living streets lack maintenance, the walls are stained and peeling, and there are also random piles of debris on the community roads. In general, the comfort and pleasure of the community space are poor. Therefore, the creation of community space should mainly consider how to improve the comfort and pleasure of the street space.

From a psychological perspective, residents have a considerable sense of belonging to the community. Compared with ordinary tourists, they prefer to carry out activities in familiar spaces. Frequent activities include chatting and playing cards, and there is a certain regularity in the time of activities. From an emotional perspective, residents like the relative privacy of the community, which provides them with a certain sense of psychological security, but brings certain inconveniences in terms of comfort. Residents' emotional memories of the neighborhood are mostly the same. If they are updated and optimized, they all hope to retain the most familiar part of their memory while improving the convenience of life.

3 SPATIAL ANALYSIS OF JIALINGXI VILLAGE BASED ON SPACE SYNTAX

3.1 Syntactic Analysis of Urban Scale

First, we focus on the macroscopic scale, analyze the spatial structure of the road network in the central urban area of Chongqing, draw the overall integration and selectivity of Chongqing, sort out the overall spatial pattern of Chongqing's main urban area, and further explore the spatial convenience of different areas, which intuitively reflects the spatial level and research value of Jialingxi Village in the spatial geographical pattern of Chongqing's main urban area (Figure 3).



Figure 3 Chongqing's Overall Integration and Selectivity

Analyzing the integration and selectivity of the entire Chongqing urban area, the overall integration and selectivity of Yubei District and Yuzhong District on both sides of the Jialing River show high values, and Jialingxi Village happens to be located next to the Jialing River Binjiang Road, which shows that its spatial system has a high spatial convenience under the contemporary urban road network layout, which is more conducive to people's understanding of the integrity of the block and the stay and distribution of citizens by walking. According to the analysis diagram, the overall selectivity of the external space of Jialingxi Village is high. Compared with the field survey, this is because the area is located in the core position of Yuzhong District, adjacent to the transportation hub, with many surrounding vitality nodes, developed transportation, and dense flow of people, which is very valuable for research.

3.2 Syntactic Analysis of Community Spatial Scale

After the analysis of the urban scale, the spatial external nodes of Jialingxi Village were obtained. Then, the syntactic quantitative analysis was mainly carried out at the internal level of the community. The street system, convex space recognizability, spatial centrality and street space form within the spatial scope of Jialingxi Village were analyzed. The different selectivities of the space were compared at different radius scales of 200~500m to obtain a more accurate spatial relationship[6].

Figures 4-6 are the integration and selectivity studies of Jialingxi Village and its surrounding road networks generated at different scales. As shown in the figure, the color domain of the road network has a large span, which means that these two parameters vary greatly in various spaces, and the accessibility of each point in the space is also different. At the same time, the color of the axis in the figure directly reflects the quantitative index of the parameter. Red represents the highest integration and selectivity, and the space is the most dynamic. As the color becomes colder, it decreases in turn, and blue is the lowest. The space approaches the red axis, which means that its integration is high and the accessibility of the crowd is strong. On the contrary, it indicates that the correlation with other roads is poor and the accessibility of the crowd is weak.

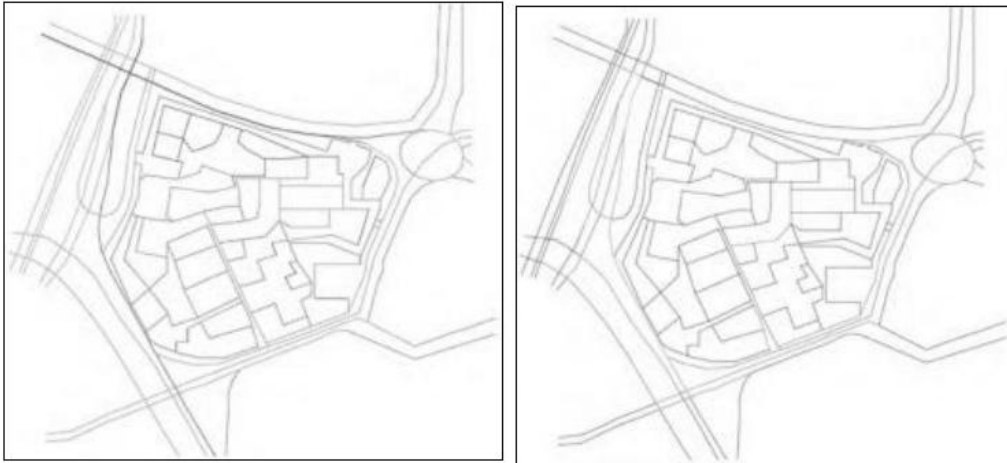


Figure 4 Radius 2000m Selectivity and Integration

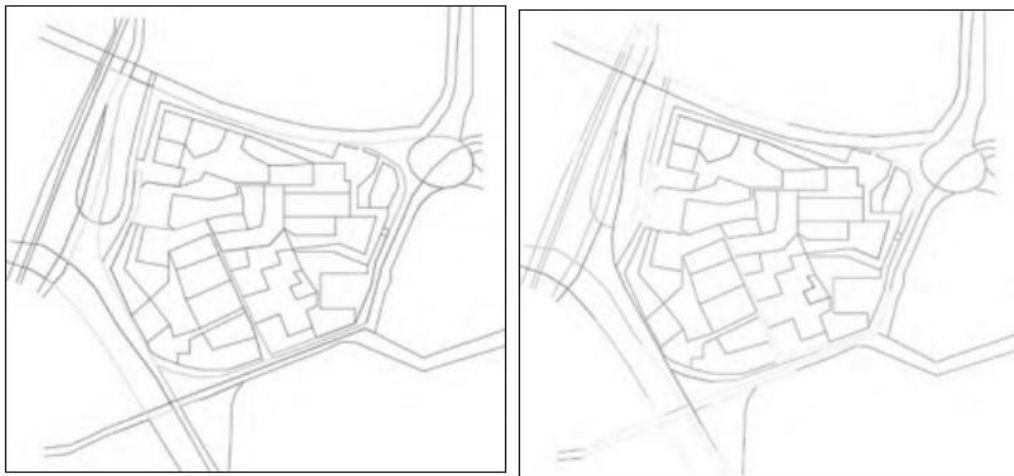


Figure 5 Radius 500m Selectivity and Integration

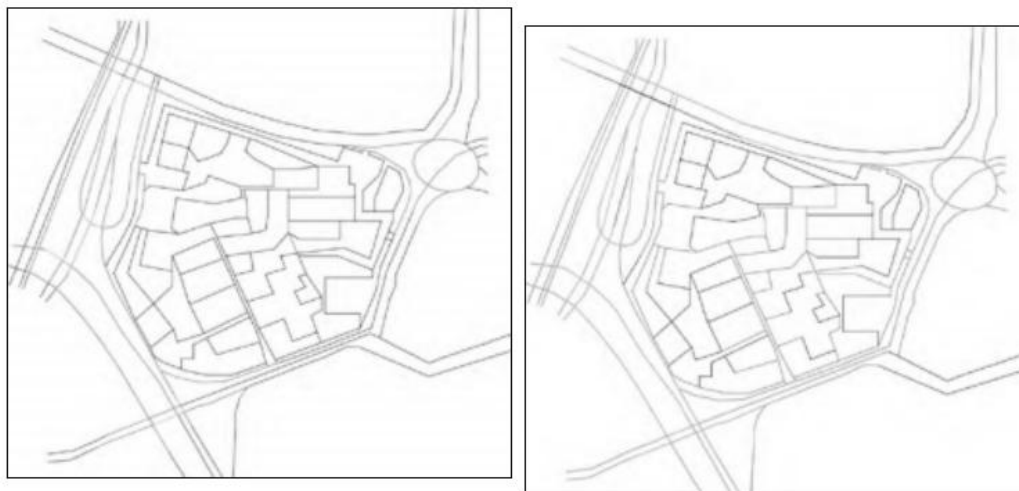


Figure 6 Radius 200m Selectivity and Integration

From the internal selectivity and integration of the community shown in the figure, combined with the functional layout and external traffic environment of the community through field research, it can be seen that the internal functions have a high degree of matching with the selectivity and integration, which also confirms the accuracy and applicability of the analysis of space syntax. We further explore the interrelationship between spatial elements and their construction, find problems, seek goals and entry points for solving problems, and elaborate on corresponding measures.

Jialingxi Village is located on a high ground on the south side of the south bridgehead of the Jialing River Bridge. The overall height difference of the community is high, and the surrounding road traffic is relatively complex, including the Niujaotuo Station of the rail transit, the Niujaotuo Interchange, and the Zhongshan Fourth Road Interchange. It is

particularly important to analyze the spatial morphological relationship between the entire community and the surrounding roads. Here, two morphological variables, selectivity and integration, are used for analysis.

From the external space of Jialingxi Village and the surrounding road network, due to the backing of two bridges and multiple urban three-dimensional transportation nodes, a high degree of integration is shown near the external space of Jialingxi Village, and the potential for spatial renovation and renewal is relatively large. Among them, the integration degree of Zengjiayan, Jialingqiao Road and Niujiaotuo Interchange of Rail Transit Line No. 2 is relatively high, and the core is at the intersection of the two bridges and Jialing River Binjiang Road. However, compared with the streets on the east and north sides, the high-heat area has obvious differences and the integration degree changes significantly, which shows that the surrounding road texture has a certain impact on the coordination of the external space layout of Jialingxi Village.

In addition, according to the results of the selectivity analysis, in actual situations, the three main entrances and exits of the community, the southwest gate, the southeast gate and the north gate, have a large flow of people, which is consistent with the results of the spatial syntax analysis and highly consistent with the definition of selectivity, that is, spaces with high selectivity are more likely to be traversed by people.

However, there is a certain difference between the flow of people at the West Gate and the analysis results. After field investigation, it was found that the reason is that the height difference of the West Gate varies greatly, the number of steps is too large, the proportion of elderly people in the community is large, and the number of people who choose to enter the West Gate is small, so the West Gate is not conducive to the flow of people.

3.3 Comprehensibility Analysis

After the integration analysis, it is necessary to further verify the correlation between the community's connection value and integration, that is, to indirectly cite the accuracy of the above analysis. The X-axis is the global integration of Jialingxi Village, the Y-axis represents the connection value of Jialingxi Village, and the three different colored points represent the internal road axis.

The fitting value is 0.498166, which is slightly less than the critical value of 0.5. This means that the spatial comprehensibility of Jialingxi Village is not high, and the internal population's perception of space and spatial characteristics is not good, which results in the irregularity of the internal population's activities. The comprehensibility of its internal core streets is significantly weaker than that of the external space nodes, resulting in the lack of orientation sense of outsiders. The spatial identifiability needs to be strengthened urgently. This is also consistent with the reality found during the survey that the internal roads of Jialingxi Village are relatively messy, the internal height difference is large, and the road directionality is poor. Combining the concepts in the previous article, it is also found that there are many inter-house roads with low selectivity in Jialingxi Village. These roads have many turns and are less likely to be traversed by people.

3.4 Human Flow Interface Analysis

To further ensure the accuracy of the analysis, this paper continues to fit the internal integration and selectivity of Jialingxi Village and draw a scatter plot. The X-axis represents the internal integration of the community and the Y-axis represents the internal selectivity of the community. The generated discrete graph is shown in Figure 10, which is combined with the pedestrian interface fitting curve for analysis.

The fit value of the size of the internal flow interface of the community is 0.341473, which is far from the limit of 0.5, indicating that the internal integration of the community is not closely related to the selectivity. Its spatial meaning is that the community space restricts residents to carry out activities and exchanges within it, and they are not closely connected with the outside world. Although it guarantees the relative independence of the internal culture of Jialingxi Village and the sense of belonging of the residents, it also weakens the spatial guarantee of its cultural flow, which is not conducive to the long-term development of the community, the exploration of cultural and tourism resources, and the shaping of historical and cultural brands, and limits the development of the spatial vitality of Jialingxi Village.

Next, we conduct a visual domain analysis. The map of Jialingxi Village is translated into a road map in CAD, imported into Depthmap, and a visual domain analysis chart is generated, that is, the higher the color, the better it can be seen by people in space. It can be seen from the figure that the internal visual domain of Jialingxi Village has a good value at the exit, but the visual data in the internal roads is not ideal, which means that the internal roads have certain defects in design, which confirms that the design is not strong enough to guide the flow of people. The potential for space improvement is relatively large, which is roughly the same as the author's feelings during the survey. It is worth noting that the urban balcony at the corner shows strong visibility, which means that the space shaping is relatively successful in the design of this landscape platform.

4 STRATEGIES AND METHODS

4.1 Explore the Potential of Urban Balconies and Create New Leisure Spaces

According to the research and analysis in the previous article, several corners in the community overlook Taipei and face the Jialing River. They are the places with the best viewing conditions and activity space in the community. They are the outdoor public activity centers of the community, and they undertake the role of outdoor concentrated activities

of residents and the display of cultural and tourism image to the outside world. In terms of space design, the historical and cultural display function of the community and the facilities serving the lives of residents should be considered. Combined with the research and analysis, it is recommended to define it as an "urban balcony" for consideration, strengthen the function of the community's elderly activity center, increase leisure seats and shade corridors, consider adding historical and cultural exhibition galleries, show the profound historical and cultural heritage of Jialingxi Village, and meet the daily spiritual and civilization activities of residents. The needs of residents are met, and the role and spatial potential of the "urban balcony" at the beginning of its establishment are fully utilized.

4.2 Internal and External Nodes are Linked to Improve Space Comfort

There are many residential enclosed courtyards in the community, showing different characteristics, such as cultural entertainment, sports and fitness, life and leisure, etc. Improvements to housing should be targeted at the diverse needs of the elderly, with measures such as increasing barrier-free facilities, upgrading infrastructure to suit the needs of the elderly, and trying a dedicated person responsibility system. In the context of a community with a more serious aging population, the living standards of the elderly can be effectively improved, laying a solid material foundation for creating a community living atmosphere. Expanding the communication space of the courtyard means that the openness of the space is increased, and indicators such as integration and accessibility are improved, and the spatial vision will also be improved.

The main entrance of the postal company along Jialing Bridge Road in the northeast of Jialingxi Village is the most active entrance for traffic, because it is adjacent to the main road of the city and is close to the bus station on foot, and is often chosen by community residents for travel. At the same time, the entrance directly faces the built "China Democratic Party History Exhibition Hall" (the reconstruction of Teyuan Kangzhuang), which is shaped as one of the cultural and tourism nodes in the community and the starting point for entering the community through steep steps. Therefore, it is recommended to directly regulate the road near the main entrance, improve the spatial cleanliness of the main entrance, improve the steep steps, optimize the access roads, and regulate the behavior of street shops occupying the road, which will greatly improve the spatial data.

4.3 Reshape the Urban Memory of a Generation with the Emotional Sustenance of Residents as the Core

Combining the emotional elements discovered in the survey, starting with factors such as residents' needs, historical and cultural resources in the community, and the built environment, by explaining the relationship between space and emotion, specific rectification and optimization strategies are proposed, focusing on the integration with existing buildings, and using cultural routes to trigger the resonance of residents' spiritual space.

For the display and excavation of historical and cultural sites in the community, it is recommended to combine the height difference steps at the entrance of the community, and arrange the display of historical events and figures such as the Chongqing negotiations at key spatial nodes to form a distinct spatial cultural feature, which is conducive to enhancing the pride and honor of residents and enhancing the recognition of the community. In the creation of the tour route, around several historical and cultural elements in the community, the surrounding roads, green plants, and entrance designs are comprehensively optimized to match the core of the spirit of patriotism, better serve residents and attract tourists.

We attach importance to the separation and integration of residents' past memories and the rapidly developing city, protect the spiritual space of residents, reorganize and refine the spatial cultural symbols of Jialingxi Village, tell the story of Jiayi through various forms such as text, photography, short videos, small sculptures, open-air exhibition halls, etc., enhance the cultural identity and sense of belonging of residents, and contribute to the integration into the current urban cultural process. We respect the original appearance of Jialingxi Village in the memory of the older generation of aborigines, and give it new value in the current era through a series of optimizations.

The positioning of historical and cultural communities in the city is very important. Residents and the government should jointly promote its renewal and optimization, and reshape the urban memory of the older generation of residents. Starting from space is the most direct way.

5 CONCLUSION

After the release of the Central Document No. 1 in 2021, "rural revitalization" has become the main theme of urban and rural construction work in the next period of time. After large-scale and rapid urbanization in recent years, China has left behind a series of problems and has entered an overall transformation stage that focuses on quality improvement. In the new era, the transformation of urban historical communities is even more responsible for improving the living environment and optimizing urban functions. How to further improve the renewal of historical communities has also received more attention. This article starts from the perspective of spatial renewal in one direction. How to analyze and optimize from the perspective of space, analyze the spatial memory and emotional needs of residents, and thus establish a corresponding relationship between the two is the problem that this article wants to explore. However, due to the fact that the spatial division and modeling are not completely accurate, the interference elements cannot be completely eliminated, etc., the final research results are still uncertain in terms of spatial grasp. It is hoped that further research in this direction can be carried out in the future.

CONFLICT OF INTEREST

The authors have no relevant financial or non-financial interests to disclose.

REFERENCES

- [1] Li Heping, Xiao Hongwei, Huang Ling. Renovation strategy for the spatial environment of traditional mountain communities - a case study of Jialingxi Village in Chongqing. *Journal of Architecture*, 2015, (02): 84-89.
- [2] Xiang Shasha. Public space creation in historical and cultural blocks based on environmental behavior. Suzhou University of Science and Technology, 2017.
- [3] Zhang Pengyue. Post-use evaluation of urban public space based on environmental behavior: A case study of Kunming Old Street. *Urban Architecture*, 2020, 17(21): 62-63.
- [4] Dai Xiaoling, Yu Wenbo. Exploration of the natural travel principle of space syntax in the Chinese context - a space syntax street network modeling method as a decision-making model. *Modern Urban Research*, 2015, (4): 118-125.
- [5] Zhang Jian, Wang Yiyang, Lv Yuan. Public space renewal strategy around subway stations in historical blocks based on space syntax - taking Zhushikou subway station in Qianmen area as an example. *Urban Housing*, 2019, 26(03): 49-54.
- [6] He Zhuoshu, Xu Huan, Huang Junhao. Research on the distribution of commercial space in historical blocks based on space syntax - taking the blocks around Guangzhou Changshou Road Station as an example. *Southern Architecture*, 2016, (05): 84-89.